Contribution ID: **1083** Type: **Poster (Student, In Competition) / Affiche (Étudiant(e), inscrit à la compétition)**

Alteration of Bacterial Cell Elemental Concentrations by Environmental Influences as Determined by Laser-Induced Breakdown Spectroscopy

Tuesday 14 June 2016 19:08 (2 minutes)

There is an urgent demand from many sectors (health, environmental safety, security, and food-processing) for a diagnostic test to rapidly and accurately identify bacterial pathogens. In recent years, it has been shown that laser-induced breakdown spectroscopy (LIBS) can provide a real-time bacterial cell elemental assay. On the basis of this assay, sensitive and specific discrimination between bacterial specimens at both the species and strain levels is possible.

In this work we investigated the impact of the elemental content of the growth environment on the LIBS spectral signature obtained from bacterial cells with a focus on three specific variables. Growth media used for cultures of *E. coli* were intentionally doped with zinc, magnesium, and glucose in varying concentrations prior to cell growth. The range of concentrations was chosen to allow both an investigation of extreme environments and also an investigation of fairly low-concentration environments that would typically be encountered in physiological (i.e. in the human body) and environmental settings. The spectra obtained from doped cells were compared to those of the same species grown in an unaltered tryptic soy agar medium to assess potential cell alteration. This study is highly relevant for the use of LIBS on cells obtained from a medical specimen for infection diagnosis as well on cells obtained from an environmental setting for use as a diagnostic of water or soil contamination.

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Session Classification: DPMB Poster session, with beer / Session d'affiches DPMB, avec bière

Track Classification: Physics in Medicine and Biology / Physique en médecine et en biologie (DPMB-DPMB)